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Roland Mudie

Environmental sustainability in the automotive industry

How is the automotive industry adapting to going green?

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The global green house gas emissions are increasing each year. One major contributor to said green house gasses is the automotive industry. Therefore, it is important to understand what the automotive industry is doing in order to combat this rising issue. This thesis focuses on discovering what kind of steps the industry is taking to mitigate emissions and go green, and how these steps have been presented to the consumers. The main objective can be summarized as attempting to understand how the automotive industry is adapting to the trend of environmental sustainability.

The focus of this paper is on the entire automotive industry, rather than on any one company in specific. This thesis is studying the past and future challenges that the industry has faced or is currently facing, in becoming environmentally sustainable and going green and communicating this to the consumers. This is done by performing a literature review.

First, this paper introduces and carefully explains the main concepts and topics related to the issue. After that, follows an examination of the regulations and policies set by governmental agencies that affect the automotive industry. The manner the industry has adapted and is pursuing innovation and figuring out a more sustainable future will also be discussed. How this sustainability has affected the automotive marketing is discussed throughout this thesis.

By using qualitative research methods and covering secondary data, this research paper will provide the reader with a basic understanding of environmental sustainability, green marketing and greenwashing as well as the past, present and future of the automotive industry related to these topics. Current phenomena like BEV's and renewable energy projects will be discussed.

After a careful analysis of the data, it was determined that the automotive industry has adapted well to going green, despite scandals of the past relating to emission data manipulation and usage of cheat devices in order to avoid sanctions. The industry as a whole has invested greatly into research and development of innovative green solutions and is striving to be more transparent with their corporate social responsibility practices and reporting. This paper shows that the sustainability aspect has a constantly increasing role in automotive marketing. However, it is important to notice that in order to actually be more sustainable, the industry needs governmental agencies to push for greener vehicles and less emissions in total, as without monetary pressure, it is entirely plausible that investments into innovative new solutions will decrease drastically, if not cease entirely.

Keywords	Green Marketing, Environmental Sustainability, CSR, Sustainability, Greenwashing, Automotive industry

Contents

List of Acronyms

BEV	Battery Electric Vehicle
CAFE	Corporate Average Fuel Economy
CO2	Carbon Dioxide
CSR	Corporate Social Responsibility
EAP	Environment Action Programme
EEA	European Environment Agency
EPA	Environmental Protection Agency (US)
EU	European Union
GHG	Greenhouse gasses
HEV	Hybrid Electric Vehicle
HFCV	Hydrogen Fuel Cell Vehicle
ICE	Internal Combustion Engine
IRENA	International Renewable Energy Agency
NHTSA	National Highway Traffic Safety Administration
N2O	Nitrous Oxide
PHEV	Plug-in Hybrid Electric Vehicle
SBI	Sustainable Brand Index

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1 Introduction

Out of all GHG's (Greenhouse gasses) in the world, CO2 is the pollutant that is emitted the most at 81% out of all pollutants (European Parliament, 1). In the European Union, transportation is responsible for nearly 30% of all CO2 emissions, 72 % of those transport emissions come from road transportation of automobiles, trucks and motorcycles etcetera. (European Parliament, 2). Climate change can be seen in various forms already appearing in Europe. Depending on the region, it can lead to the loss of biodiversity, it may cause forest fires, decreasement of crop yields as well as cause heat wawes which in some instances may cause death in humans as well as wildlife (European Parliament, 3).

Luckily there has been a rise of green consumerism, which has fortunately had a significant impact on corporate social responsibility (CSR) and corporate environmental performance. Green consumerism refers to consumers who wish to purchase products or services that have been produced in a way that does not harm the environment or has a positive impact on the environment (Porter and Kramer. 2006)

Even though there is a lot of conversation around environmental sustainability in Europe and the world, the concept is not necessarily limited to an ecological perspective. Different cultures have different interpretations of the concepts of environmentally friendly or being green and usually these different interpretations have a social and cultural connection (Peattie. 1995)

Unfortunately, as consumer concerns of environmental sustainability have risen and green marketing, the planning, development and promotion of products and services that satisfy the needs and wants of consumers without negatively affecting the environment in regards to everything from raw materials, energy consumption, shipping and or production (Polonsky, 1994), has increased its standing as a legitimate form of marketing, the phenomenon of greenwashing has come along with it. Plainly explained, greenwashing is the practice of producing misleading or unevidenced claims regarding a company's environmental impact. This practice has become a widespread ethical concern. (Berrone et al. 2015).

Concerns regarding the environmental impact of doing business have existed for decades, if not centuries, although the importance of the topic has varied considerably over time. The latest and perhaps the most important trend in responsibility seems to have begun in the late 1960's and 1970's, when the so-called counterculture movement began to actively challenge the values of industrialized society and practices. Around this time, for the first time, debates began on a large-scale environmental crisis that had begun to be predicted by years of previous neglect (Peattie. 1995) 2 major contributors to this were (a) the publication of "Silent Spring" in 1962 by Rachel Carson, and (b) the publication of "Limits to Growth" in 1972 by the Club of Rome, an international team of scientists concerned about runaway economic growth in a resource-limited planet, echoing the concerns raised in 1966 in an essay "The economics of the coming spaceship Earth" by Kenneth Boulding. Since these early contributions there has been exponential growth of studies and arguments aimed at highlighting the unsustainability of our consumerist culture.

According to Peattie, ecology and sociality go so close together that one cannot function without the other. The concepts of environmental sustainability and green/environmental marketing will be widely used in this thesis, on top of including Corporate Social Responsibility (CSR) and especially the emissions scandal of Volkswagen, this thesis will also focus on the social aspect of green marketing. If the concepts are viewed in the context of sustainable development, environmental marketing is the most logical option: Environmental and social responsibility are linked in marketing, and financial responsibility is not generally considered as a competitive tool for marketing communications. Green marketing is a part of responsible business, but it is also about following marketing standards and guidelines rather than simply communicating about responsibility. In other words, marketing is not simply communication or packaging, but instead a concept of the product or service as a complete whole (encompassing the entire value chain).

The EPA is the environmental protection agency in the United States of America, it was founded in 1970 and it is an independent agency of the United States federal government that focuses on enforcing federal laws that ensure that Americans have clean air, land and water. (EPA. 2020). In the United States of America, the EPA has tightened emissions controls ever since they were established, as more information has come

available through research about harmful pollutants; for example, emissions from cars. The strictest restriction the EPA has enforced was in 2004, when the EPA as well as the federal government created a diminution of 94% in the amount of allowable emitted nitrogen oxide from vehicles tailpipes, from 1.25 grams to 0.07 grams per mile. Nitrogen oxide emissions from vehicles endanger human lives and trigger diseases such as asthma, respiratory, cardiovascular, bronchitis and premature death. These new regulations being pushed by the EPA, caused automakers who were manufacturing fuel-efficient diesel cars immense hardship, especially Volkswagen as they made it seem as they had cracked the regulations problem with their new TDI Diesel engines. Other car manufacturers left the US diesel market for Volkswagen. (Mansouri,N. 2016)

The equivalent for the EPA in Europe would be the EEA (European Environment Agency) which is a part of the EU (European Union). The EEA was established in 1990 and has partner countries that are not a part of the EU, these countries are Norway, Iceland, Liechtenstein, Turkey and Switzerland. The EEA helps the EU and their member countries make informed decisions when it comes to matters regarding the improvement of the environment, integrating environmental considerations into economic policies and moving towards being more sustainable. (EEA. 2020)

The EEA inform about policy implementations, they assess systemic challenges to support the EU's EAP (Environment Action Programme), which identifies three key objectives, protecting, conserving and enhancing the EU's natural capital, turning the EU into a resource-efficient, green and competitively low-carbon economy and to safeguard the citizens from environment-related pressures and risks to health and wellbeing. (EAP. 2020)

The purpose of this paper is to examine environmental sustainability in the automotive industry and how it manifests as green marketing and greenwashing in the industry. The framework of this thesis is compiled from environmental sustainability, environmental marketing and other concepts closely related to green marketing and greenwashing within the automobile industry. This tesis is chronologically structured, starting from the factors that have contributed to the emergence of environmental marketing and ending with the expression of green values in modern marketing communications within the automobile industry. After the concepts and theory for environmental sustainability,

green marketing and greenwashing have been explained sufficiently, an overview of how they manifest in the automotive industry is provided. Ultimately, a conclusion of how green marketing can be seen in the automotive industry will be provided.

2 Literature review

In order to understand how the automotive industry is adapting to a greener world, it is important to review literature around sustainability in the automotive industry. This section of this thesis will focus on the literature that forms the theoretical framework for the topic. The literature review will discuss the main aspects around environmental sustainability, green marketing and greenwashing that are relevant in the automotive industry. Themes that will be covered are greenwashing scandals, newly implemented laws and regulations affecting the industry, and how green marketing is used to attract the interest of the more conscious consumer in order to for example avoid paying for sanctions from regulations set by governmental agencies. It is important to explain and cover the basics of motivation for the automotive industry to go green in order to comprehend why they have moved towards being more environmentally sustainable and why they have also had greenwashing scandals, and if they will have more in the future or if they've learned from the past.

In this literature review of "Environmental sustainability in the automotive industry" information will be gathered and surveyed from reliable journal articles, scholarly articles, books, governmental policies and any other resources relevant to my particular area of research. I will be doing so by providing descriptions, summaries and critical evaluations of these works in relation to the research question being investigated. Literature reviews are designed to provide an overview of sources that I have explored while researching my particular topic and to demonstrate to my readers how my research answers the topic and question being researched. (Fink. 2014)

2.1 Sustainability

The United Nations World Commission on Environment and Development, or the Brundtland Commission described in a 1987 report sustainability as three co-equal parts

or elements conveniently starting with the letter e in the English language, these three were: environment, economy and equity. These three e's are sometimes described as the three pillars of the concept, sometimes overlapping (Figure 1). The argument for the three e's is that sustainability can only be achieved when economic growth, environmental protection and promotion of equity are working together, hand in hand to maintain Earth's carrying capacity. (Portney, 2015 pp. 6-12)

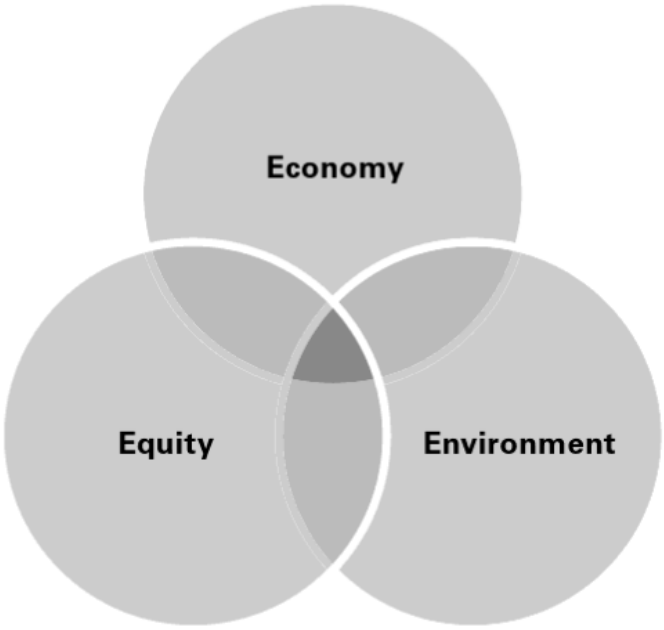

Figure 1. Three overlapping e's of sustainability. (Portney, 2015 p.9).

Two attempts to analyse and develop in order to reveal the meaning of the ideas and the intellectual foundation of sustainability can be found in Portney's text. Portney (2015) gives six roots of sustainability and six definitions for sustainability seen in Figures 2 & 3, below.

Six roots of sustainability[a]	Points of emphasis
Ecological/ carrying capacity	Maintenance of natural systems so that they can support human life and well-being
Resource/ environment	Promoting economic growth only to the extent and in ways that do not cause deterioration of natural systems
Biosphere	Concern with the impacts of humans on the health of the Earth and its ability to support human populations
Critique of technology	Rejection of the notion that science and technology, by themselves, will protect and save the Earth
No growth–slow growth	Limits to the ability of the Earth to support the health and well-being of ever growing populations
Ecodevelopment	Adapting business and economic development activities to realities of natural resource and environmental limits

Figure 2. Six roots of sustainability. (Portney, 2015 p.9).

Six definitions of sustainability[b]	Points of emphasis
Carrying capacity	Optimum and maximum ability of Earth's systems to support human life and well-being
Sustainable use of biological resources	Maximum sustainable yield from natural systems, such as forests and fisheries
Sustainable agriculture	Maintaining productivity of farming during and after disturbances such as floods and droughts
Sustainable energy	Renewable alternatives to fossil fuel reliance to produce heat energy
Sustainable society and economy	Maintaining human systems to support economic and human well-being
Sustainable development	Promoting economic growth only to the extent and in ways that do not cause deterioration of natural systems

Figure 3. Six definitions of sustainability. (Portney, 2015 p.9).

The exact meaning of sustainability depends on the subject matter at hand and the context in which it is used varies in fields of ecology, environment, energy, economics, population, agriculture and demographics. (Portney, 2015 p. 55) According to Adams, W (2006) The core of sustainability in the mainstream is formed from three dimensions, the economy, society and the environment, which all together form the three pillars that create and support sustainable development. (see figure 4)

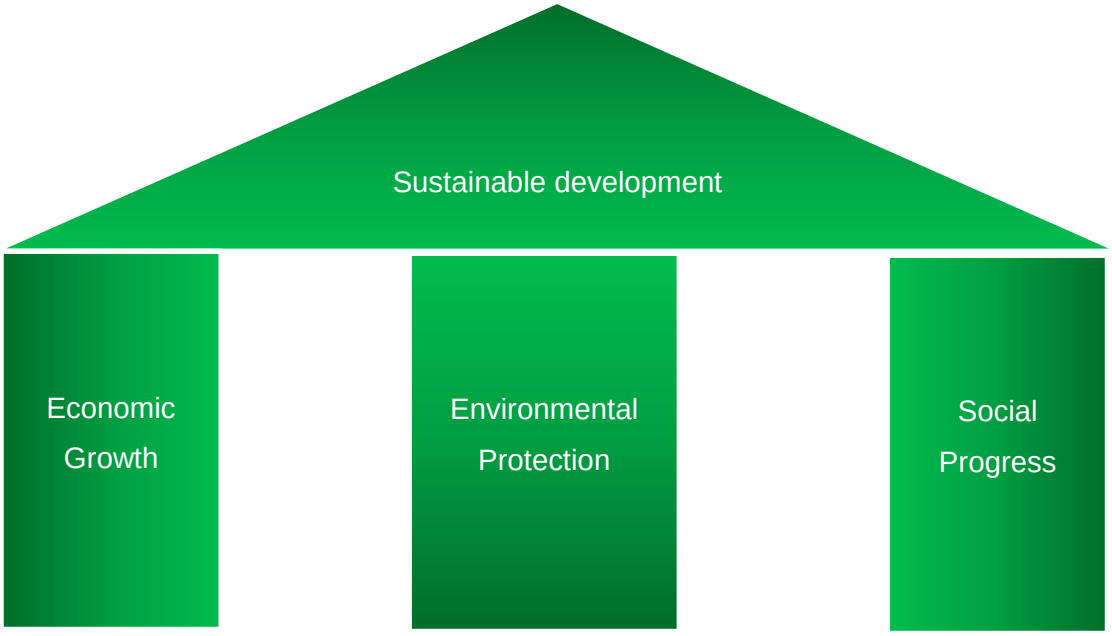

Figure 4. Three pillars of sustainable development (Adams, W, 2006 p.2).

As previously explained, sustainability and sustainable development is formed from largely the same ideas, but the exact meaning of sustainability differs depending on the context and area in which it is used and how it is used, it is also often associated with maintaining Earth's carrying capacity, either by making changes in human behaviour, either collectively or individually or through innovation and applying new and developing technologies in order to minimize the effects of harmful actions and behaviours. (Portney, 2015 p. 12)

In 1987 the Brundtland commission's report gave the most comprehensive description and explanation of the idea and theory of sustainable development. As there is no universally accepted definition for sustainable development for the purpose of this thesis the definition of the Brundtland commission or the World Commission on Environment

and development from 1987 will be used “Sustainable development is development that meets the needs of the present, without compromising the ability of future generations to meet their own needs. (United Nations, 1987).

2.1.1 Sustainability trending

Sustainability has become a mega trend that is built on the foundation of protecting our planet and its resources. A mega trend is a large, overarching direction that shapes the world of business for over a decade. Even as sustainability was introduced decades ago, it is far from reaching its peak as society is demanding organizations to become responsible for their environmental sustainability and CSR. More and more consumers are putting their money where their mouth is, so to speak and purchasing products from, advocating and supporting organizations that are committed to environmental sustainability. (Institute for Sustainability, 2020)

The sustainable brand index (SBI) is Europe’s largest independent brand study that focuses on sustainability, they have been conducting yearly studies from a B2C (Business to consumer) perspective since 2011 and B2B (Business to Business) since 2017. They gather information from over 50 thousand consumers from more than 20 industries, that they then study and analyse in sustainability, in total they have been able to evaluate 1148 different brands. Their studies are currently being conducted annually in Norway, Sweden, Finland, Denmark and The Netherlands. (SB Insight AB. 2019)

Taking a look at the SBI study’s results from Finland proves that Finland’s dedicated sustainable consumers are at an all time high with 28% of consumers categorized into a behavioral group called “Smart” and another 7% in “Dedicated”.
These behavior groups are two of four behavioral groups, categorized in the research, adding up to a total of 35% of the population showing a strong or very strong interest in sustainability. The other two behavioral groups are “Ego” and “Moderate”.
“Ego” still at 21% of the population (27% in 2018), and “Moderate” at 44%.

Consumers belonging to the “Ego” category are not interested in sustainability in any way, when consumers in the “Moderate” category are showing an increasing amount of interest in sustainability as they encounter information about it.

This research strongly suggests that the market for sustainable products and services is growing in Finland and that consumers in Finland will in increasing numbers be happy to spend their money with strong sustainable brands. (SB Insight AB. 2019) The percentage of consumers who say that sustainability impacts their purchasing decision in the Nordic countries is on clear upward trajectory (see figure 5) and the amount of consumers willing to pay 10% and 25% more for sustainable alternative products or services are close to a third of consumers for 10% and a quarter for 25%.

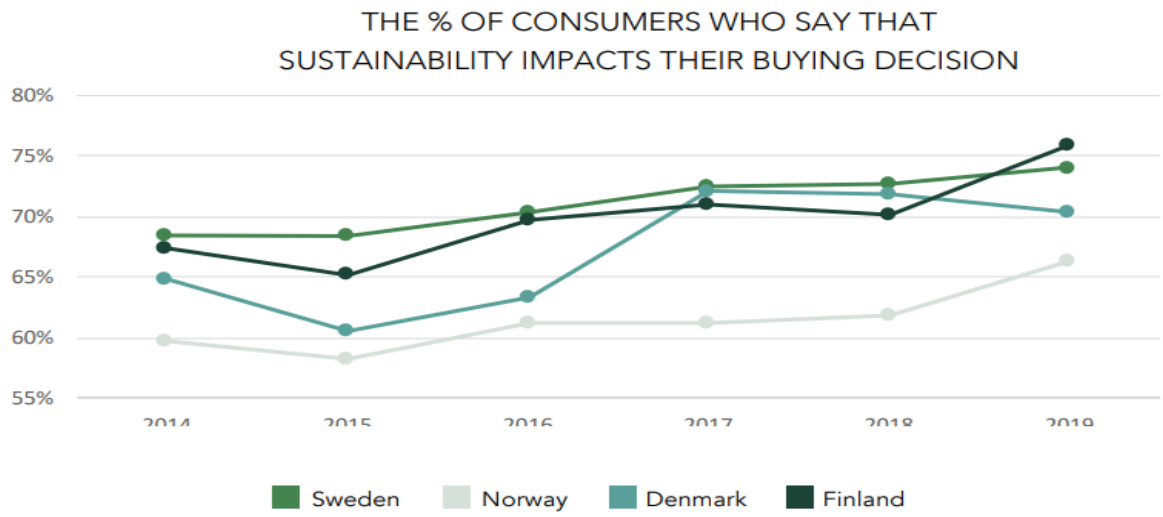

Figure 5. Sustainability impacting purchasing decision (SB Insight AB, 2019).

FMCG Gurus is a company that provides market research and insight into consumer attitudes and behaviours around the world. According to FMCG Gurus research 61% of European consumers are concerned about the state of the environment and 55% think the situation has gotten worse in the last 2 years. 50% of European consumers are concerned about global warming and 52 % have an interest in lowering their own carbon emissions. Even as 55 % of European consumers are willing to pay a more premium price for more environmentally friendly products and 44% of consumers are actively looking for brands that use global warming initiatives and communicate their green actions an alarming 35% or these consumers have become less trusting of brands as they do not believe the brands have either the consumers or the environments best interests at heart. (Cowling, W. 2019)

2.2 Environmental/Green Marketing

The AMA,(2020) (American Marketing association) defines marketing as "..the activity, set of institutions, and processes for creating, communicating, delivering and exchanging offerings that have value from customers, clients, partners and society at large." or in other words, the entire process of creating a product or service, informing consumers of said product or service and finally the delivery and sale of the product or service, which the consumers perceives to have value. In order to understand green marketing one must first be aware how it differs from traditional marketing.

Environmental or green marketing is often thought of as solely the promotion or advertisement of products with positive environmental charecteristics. Some of the terms consumers most often associate with environmental/green marketing are: phosphate free, renewable, reusable, recycled, ozone friendly, emission compensated and environmentally friendly to name a few. Even as these terms are green marketing claims, environmental/green marketing is a much broader concept, one that can be applied to consumer products, industrial products and services.

Henion and Kinnear were some of the first to define environmental marketing in 1976 as "The study of the positive and negative aspects of marketing activities on pollution, energy depletion and non energy resource depletion" (Henion and Kinnear quoted by Polonsky 1994, p2). According to Polonsky (1994) environmental marketing consists of all activities that are designed to generate and facilitate any human wants and needs and that the generation and facilitation of these products and services occur with minimal impact on the natural environment. This definition of green marketing is much broader as it also incorporates a large amount of the traditional components of the conventional definition of marketing and while defining conventional marketing it also includes the protection of the natural environment.

In other words, environmental/green marketing refers to the planning, development and promotion of products and services that satisfy the needs and wants of consumers without negatively affecting the environment in regards to everything from raw materials, energy consumption, shipping and or production, etcetera. Polonsky's (1994) definition

of green marketing is clear and easily understandable and still applicable today, nearly three decades later.

2.2.1 Green marketing in the automotive industry

Polonsky (1994) noticed five explanations for firms to use green marketing, which were, opportunity, social responsibility, governmental pressure, competitive pressure and cost or profit issues.

- Opportunity: If there are two nearly identical products, with similar quality, price, performance and availability, a consumer will choose the product that has a positive environmental impact, and thus being green is a competitive advantage.

- Social Responsibility: As most companies or organisations today understand that they have a moral obligation to be more socially responsible, simultaneously there is an increasing societal pressure for companies and organisations to improve their CSR, transparency and communication about what they are doing, for example in yearly sustainability reports.

- Governmental Pressure: As some companies or organisations might want to be green out of their own feeling of moral obligation, some receive pressure from governments as it is one of any government's main tasks, to take care of their citizens and environment. By introducing governmental regulations and issuing sanctions to ensure that policies that protect the environment are being followed and respected.

- Competitive pressure: As mentioned in the opportunity section, there is an increasing amount of pressure from competing companies that are already embracing and promoting the environmental friendliness of their products that have a competitive advantage, gained from green marketing.

- Cost or profit issues: The last reason for companies or organisations to use green marketing is matters associated with cost or profit issues. When a company looks at how they can reduce waste for example, companies are often forced to take a look at their entire production process which can lead to more effective processes in reducing waste materials and recycling them but also it can reduce the amount of raw materials used in production or it can inspire innovation in developing new techniques and materials to be used. This all leads to minimization of costs and enhancing profit.

  (Polonsky, 1994)

These five explanations of green marketing can and are already implemented in the automotive industry, as technology for greener vehicles improves, they become cheaper and will eventually be in the same price range with ICE vehicles, which is where the opportunity comes in. An example of this could be the SEAT Mii (2020) which is priced at around 20 000 € before governmental incentives. At the moment, ICE vehicles in the same segment are usually cheaper, although one can easily find ICE vehicles close to this segment with a price much higher. Most if not all companies in the automotive industry are reporting on their sustainability and CSR actions. Governmental pressure as well as competitive pressure is increasing as governments are setting regulations that the automotive industry must follow and other companies are coming out with new innovations constantly.

Behaviour in the automotive industry regarding green cars and producing less or zero pollutant emitting vehicles has changed and improved in the last decade. The behavioral change can be explained by the rise of green consumerism which has had an impact on governmental policies, restrictions and regulations. Green consumerism is not the only thing that has impacted these governmental steps to be taken as one might suspect a great contributor is and has been due to greenwashing scandals in the automotive industry.

2.3 Greenwashing

Greenwashing should be considered as an important part of green marketing, even though it is not and should not be confused as being the same thing. The goals of greenwashing can be the same as the goals of green marketing, but the means used to achieve said goals are often not based on facts and can be considered as fraudulent. There are many forms and means of greenwashing, but it is often defined as an activity in which more resources are used to create an environmentally friendly image, than they are used to take on environmental responsibility. In other words, when the purpose of environmental/green marketing is to bring responsible products to the consumer, the goal of greenwashing is to create an environmentally friendly image of products that are conventional or even harmful to the environment. (Grant, J. 2007)

The clear distinction between, greenwashing and green marketing is that unlike greenwashing, green marketing has legitimate, environmentally positive actions regarding their products, company or organisation. Companies or organisations that practice green marketing are usually honest, transparent and practical. Terms like, eco-friendly, organic, natural and green are some of the examples that are widely used when advertising products, these terms can be confusing and mis-leading to consumers and companies that do advertise in this manner should have information to prove their claims readily and easily available to the consumer. According to some, greenwashing is in a corporation's best interest, as if successful a company can attract green consumers to purchase their products. (Corcione, A. 2020) According to a study by Nielsen's Global Corporate Sustainability Report, 66% of consumers are willing to spend more on a product if it comes a sustainable brand, this was in a report from 2015, so one can only assume according to other trends and reports that those numbers are now higher. (Nielsen, 2015)

The most famous and most brought up study regarding greenwashing can be said to be 'The Seven Sins of Greenwashing', conducted by TerraChoice (2007), an environmental marketing agency based in Canada, acquired in 2010 by UL Environment. The study aptly lists the seven sins of greenwashing, which according to TerraChoice (2007) are:

1. Hidden Trade-Off: Using environmentally friendly labels based on small and insufficient sets of attributes, such as made from recycled plastic, when other attributes of production or materials are not addressed, such as manufacturing energy usage, GHG emissions from packaging or transportation etcetera have a greater negative impact on the environment. In other words, promoting one ecological thing about a product and hiding other harmful information.

2. No Proof: Simply making claims of a product's environmental friendliness without providing easily accessible evidence on said product or the products website. In other words, not supporting your claims with proof.

3. Vagueness: The usage of broad terms that have no clear or have poor definition, that might not be understood. An example could be promoting a laundry detergent as 'All Natural' that might contain harmful ingredients even if they are naturally occurring.

4. Irrelevance: Making true statements about a product that are technically true but not a distinguishable factor when looking for environmentally friendly products. As an example, a product advertised as CFC free – but since CFC's are banned by law, the statement is unremarkable and irrelevant.

5. Lesser of Two Evils: Making claims of being more environmentally friendly than other products in the same category when the entire category might be environmentally unfriendly, for example an organic cigarette might be greener but it is still a cigarette.

6. Fibbing: Simply advertising something that is not true. i.e., claiming to be certified by a known and respected standard or label but isn't.

7. Worshipping False Labels: Implying a product being certified or endorsed by a third party certificate that doesn't actually exist, often by using fake certification labels.

Figure 6. The Seven Sins of Greenwashing (D'Alessandro, 2014).

As we can see on Figure 6, based on the data gathered and analysed from the study conducted by TerraChoice (2007), 95% of products are guilty of one or more of the seven sins. The study shows that with products at the time of the research there were really only four sins of relevance, in no particular order, hidden trade-off, no proof, vagueness and worshipping false labels. When looking at tips in order to avoid consumers from falling prey to greenwashing they should look for life-cycle based products that are certified by a reliable third-party, held to a standard that is easily available to the public and the products development process is transparent. Consumers who wish to avoid purchasing greenwashed products should always read each product label as well as the fine print, research product reviews online before purchasing and purchase products from a known and trusted source. (D'Alessandro, 2014)

2.3.1 Greenwashing in the automotive industry

As a part of 'Earth Day' TruthInAdvertising (2020) published a report on the top companies accused of greenwashing. At number one of this list they have listed Volkswagen, BMW, Chevrolet, Ford and Mercedes-Benz for the reason of "Clean diesel' autos". As TruthinAdvertising (2020) states, advertising diesel vehicles as clean when in fact the vehicles emitt GHG's way over legal limits is simply a sin of greenwashing. Volkswagen's cheat device, emissions scandal in which they admitted to rigging cheat-devices in over 11 million vehicles that they claimed to be clean diesel vehicles. Other car manufacturers such as BMW, Chevrolet, Ford and Mercedes-Benz have all faced similar allegations in recent years, with stating that their vehicles are "BlueTec" vehicles that are marketed as "clean diesel" and "Earth friendly" when they release nitrogen at levels that are 65 times over the legal limit set by the EPA. (TruthInAdvertising, 2020)

As reported by the BBC, Mitsubishi admitted to falsifying fuel economy data in more than 600 000 vehicles sold in Japan by falsifying tyre pressure figures in order to achieve flatter mileage rates. After admitting to falsifying the results, Mitsubishi saw a 15% decrease in share prices in Tokyo as the admittance of international wrongdoing was reported. Even as the wrongdoing is not close to being as large as Volkswagens cheating scandal, or as sophisticated it is another instance where trust in the automotive industry's reputation has been damaged. (BBC, 2016)

Emissions taxes and environmental standards are widely considered as the most common policy instruments for regulation of environmental externalities. Taxes generally raise government revenue, while usually an environmental standard specifies with a certain degree of precision the actions that a firm should undertake to achieve certain objectives. An emission tax works through the market imposing a higher cost per unit of production. Pollution is therefore priced by the tax inducing entrepreneurs to release less of it. By leaving polluters free to choose their optimal emission levels, they can use their own strategy in order to minimize their costs. The optimal process for polluters minimizes their total private costs by reducing emissions until the tax rate equals their marginal abatement cost. Governments imposing green regulations, taxation and sanctions are a major reason for greenwashing in the automotive industry. (Lambertini, L, Pignataro, G, Tampieri A. 2014)

”Greenwashing is actually in a corporation’s best interest,” said Deandra Jefferson, an office manager at a sustainability organisation she requested go unnamed, in an interview with Business News Daily. ”Although the concept of corporate social responsibility exists, it is very rare that corporations actually live up to them, and when they do, it’s a surface level effort to make themselves look good.” Or in other words, greenwashing is only beneficial for a company when they successfully deceive their customers and transparency of a company is a legitimate solution to bridge the gap of artificial or fake and genuine and real concern for the environment. (Corcione, A. 2020)

As stated earlier, the motivation for greenwashing is usually the same as the motivation for green marketing and truthfully being environmentally friendly, the difference being, when a company chooses to greenwash their products instead of finding environmentally sustainable solutions to their products, their main motivation is monetary, whether in the from of avoiding sanctions from governmental imposed environmental regulations, taxation related issues or jumping on the trend of sustainability and attracting the rising consumer segment of green consumerism, the motivation is always monetary, one way or another.

3 Motivations and incentives for the automotive industry to go green

As was established in the literature review part of the thesis, environmental sustainability is a growing megatrend that has also affected the automotive industry. Green consumerism introduced in the literature review is naturally one reason the car manufacturers are interested in becoming more sustainable. However, this next section of this paper will also discuss some other main motivations that incentivise the automotive industry to spend as much as they do in research, development and innovation. The role of policies implemented by governmental agencies, as well as some information about how and why the automotive industry has had its good share of greenwashing scandals, are also discussed. Finally, an overview of the relevance of renewable energy and electric vehicles will also be provided.

3.1 Governmental regulations

The European Union has committed to cutting its GHG's by at least 40% below 1990 levels by the year 2030 in order to follow the Paris Agreement and to work towards carbon neutrality by the year 2050. Carbon neutrality is precisely what it sounds like, having a balance between emitting and absorbing carbon from the atmosphere into carbon sinks, which is any system that absorbs more carbon than it emits, some of these natural carbon sinks are soil, forests as well as oceans. Natural carbon sinks remove an estimated 9.5 to 11 Gt of CO2 annually, while in 2017 global CO2 emissions were 37.1Gt. (European Parliament)

As transportation accounts for around 30% of CO2 emissions in the EU and road transportation which is the causation of the automotive industry, accounts for the majority of that at 72%, the European Union as well as other governmental agencies around the world have organised and set regulations for regarding GHG's and CO2 emissions in for the automotive industry among others. The CAFE (Corporate Average Fuel Economy) standards for example set by the U.S. Congress.

The U.S Congress first enacted CAFE standards in 1975 in order to reduce energy consumption and increase fuel economy. The automotive industry follows standards set by in CAFE regulations by creating more fuel-efficient vehicles. The CAFE standards are regulated by the NHTSA, which enforces the standards and the EPA monitors car manufacturers average fuel economy levels and checks that they follow GHG standards set by the EPA. The NHTSA and EPA together control and monitor regulations in the automotive industry in the United States. The EPA and NHTSA harmonized fuel economy standards with GHG standards issued by the EPA to require a maximum of 163 grams per mile (~1.6km) cars produced with a 'model year' from 2017 to 2021. Model year refers to the year said model was designed and manufactured. The EPA will re-evaluate the GHG standards for model years 2022-2025 and the NHTSA will set new CAFE regulations for those model years as more information is gathered at a later date. CAFE standards will improve the nations energy efficiency and reduce petrol consumption, promote and advance innovation for new technologies and increase the availability of alternative fuel vehicles as well as lower GHG's, improving air quality and help mitigate climate change. (US, DOT, 2014)

Starting from September 1st 2020, the new European Union vehicle type-approval framework will be in place and will significantly rase the quality level and independence of vehicle type-approval and testing while increasing checks on vehicles already on the EU market. The European Commission tabled legislative proposals for the automotive industry to ensure compliance with all EU safety, environmental and production requirements which were proposed by the commission following the Dieselgate scandal. This reform is only a part of the commissions Europe on the Move initiative which was already reviewing the EU type approval framework before the Dieselgate scandal. Jyrki Katainen, Vice-President for Jobs, Growth, Investment and Competitiveness, said: *"In a Single Market where goods circulate freely, everyone must play by the rules. The Volkswagen revelations have highlighted that the system which allows cars to be placed on the market needs further improvement. To regain customers' trust in this important industry, we need to tighten the rules but also ensure they are effectively observed. It is essential to restore a level playing field and fair competition in the market."* (European Commission, 2016).

3.1.1 Dieselgate

In 2007 the EU introduced rules that prohibited car manufacturers from using defeat devices in calculating emissions from vehicles. In 2011 it was found that the levels of NOx emissions exceeded the EU levels by up to 14 times in different models of cars and in 2014 the ICCT (International Council on Clean Transportation) revealed Volkswagen to be emitting excessive emission volumes in several of their models, the following year the EPA accused Volkswagen of installing cheat devices in their vehicles and after a lot of denial and admittance of several accusations, lawsuits and settlements related to NOx emissions and cheat devices VW finally caved and admitted to cheating and greenwashing their vehicles. In total around 11 million Volkswagen vehicles were recalled. In December of 2018 the VW group has announced of its intentions to invest nearly 44 billion euros into innovation in the form of e-mobility, autonomous driving, digitalization as well as other modernization measures as they wish to speed up the pace of innovation and make BEV's affordable for the general public, or in other words to take BEV's from the luxury and premium segments and make them available for most consumers. (Armeland & Wehrmann, 2020)

3.2 Emissions caused by the automotive industry

According to the EEA (2019) energy related CO2 emissions from road transportation emissions increased in almost all member states between 2017 and 2018 and road transportation had the highest increase in absolute terms of all energy-related emissions between 2017 and 2018, while public electricity and heat production as well as manufacturing industries and construction saw a decrease of energy related CO2 emissions. Fortunately emissions from fuel combustion had a decrease of 81.6 Mt of CO2 eq or 2.5%.

Transportation is responsible for approximately 30% of the European Union's entire CO2 emissions out of which road transportation causes around 72% (see figure 7 below) which in turn is caused by the automotive industry.

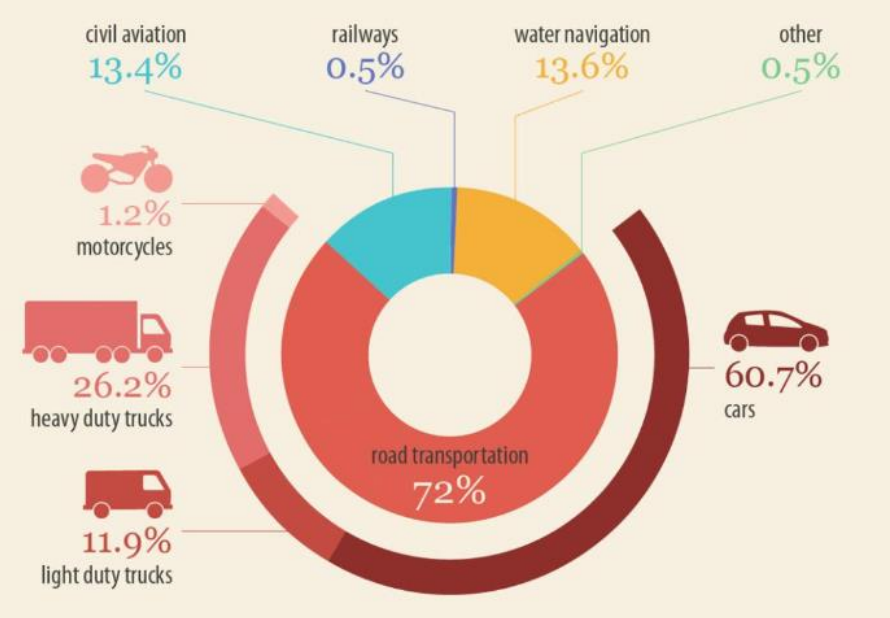

Figure 7. European Union CO2 emissions by transport mode (European Parliament, 2)

As these figures only show emissions from road transportation in the European Union, according to the WHO (World Health Organization), globally transportation accounts for 23% carbon dioxide emissions in 2010 and 27% of end-use energy emissions with urban transportation accounting for 40% of end-use energy consumption. CO2 has long term global warming effects as it stays in the atmosphere for over a century. (WHO, 2020)

3.2.1 Sanctions in the automotive industry

JATO is a company that specializes in gathering data from the automotive industry, they cross-reference everything from emissions to detailed lists of features included in cars and they compile this information into an easy to understand format where anyone can evaluate differences between different makes and models from any company. JATO is a common tool used in the automotive industry especially for competitor analysis.

According to JATO, car manufacturers that are selling vehicles in Europe might have to pay an excess emission premium in 2021 CO2 targets set by the EU in the amounts of 33.6 billion euros. The 33.6 billion euro estimation is based on figures from the previous year, 2018 and the fines are set by the European Commission from 2019. These estimates of course do not take into account that the automotive industry as a whole is working hard to produce greener vehicles in order to avoid said penalty payments. The target is that all vehicles must meet the targets of 95 grams of CO2 per kilometer, which is currently 24.7g/km less than the recorded average from 11 manufacturers selling more than 300 000 vehicles in the EU in 2018. In 2018 the recorded average for Volkswagen group, PSA, Renault group, Nissan Group, BMW group, Hyundai-Kia, Ford, FCA, Daimler, Toyota and Volvo was 119,7 g/km which was an increase of 2,4g/km compared to 2017. (Munoz, F, 2019)

JATO

Penalty payments for excess emissions
Assumption: no changes until 2021

	Δ Actual vs Target g/km	Penalty (€/unit)	Units Regs 2018 (000)	Total Penalty (€ billion)
VW Group	26.6	2,525	3,638	9.19
PSA	23.1	2,194	2,457	5.39
Renault Group	23.2	2,207	1,615	3.57
BMW Group	27.5	2,609	1,018	2.66
Hyundai-Kia	30.0	2,852	1,011	2.88
Ford	27.1	2,576	992	2.56
FCA	35.5	3,373	961	3.24
Daimler	33.6	3,192	941	3.01
Toyota	7.8	745	733	0.55
Nissan Group	19.0	1,807	630	1.14
Volvo	25.5	2,425	317	0.77

Figure 8. Estimated penalties for excess emissions in the EU (Munoz, F, 2019).

The estimated penalties per group, reaching the amounts of figures mentioned in figure 8. above, are a great incentive and motivator for the automotive industry to invest in research and development of greener automobiles. These figures are of course the worst case scenario, in which none of the companies take any steps towards electrification of their automobiles, which is of course already happening with a lot of new HEV's, PHEV's and EV's being announced from different companies on a regular basis. These new vehicles of course either being fully electric or hybrids, decrease the total amount of CO2 per kilometre, emitted by the companies and thus lowering the amount of penalties.

3.3 Electric vehicles

There seem to be a lot of questions about electric vehicles and if they really produce less CO2 emissions than ICE (Internal combustion engine) vehicles, taking into consideration that the actual manufacturing as well as the disposing of a BEV is less environmentally friendly than that of an ICE vehicle. Even as fully electric vehicles or BEV's currently only account for approximately 1.5% of new registered vehicles in Europe, they are gaining traction. Comparing the popularity from 2016 to 2017, the amount of BEV's sold around Europe increased by 51%, and the trend looks to have stuck, taking a look at Norway for example which is not a part of the EU, but is a pioneer in reducing CO2 emissions caused by automobiles and has taken serious action to electrify their vehicles, which looks to be something the EU is attempting to follow. (European Parliament, 2)

BEV's are not 100% clean and no vehicle ever will be, but they are clearly the better choice for the environment, so in the case that one needs to use a car, they should use an electric vehicle if they are concerned about the environment. Electric motors are simply more efficient than internal combustion engines, as the vehicle ends up being used to drive the vehicle. As BEV's simply produce no tailpipe emissions of air pollutants like nitrogen oxides and particles the main benefit health-wise is related to air quality. (Unterstaller, 2018)

According to research conducted by LowCVP (2015) regarding life cycle CO2 emissions from vehicles, BEV's as well as PHEV's produce an estimated 19 tonnes of CO2 , while HEV's produce 21 tonnes of CO2 and standard gasoline or ICE produces 24 tonnes of CO2 emission during the vehicles entire lifecycle.

OFV (2020), is a website that tracks everything regarding registrations of new vehicles in Norway. According to OFV (2020) 142,381 new vehicles were registered in Norway in the year 2019, out of those vehicles 42.4% were fully electric BEV's, and 25.9% were Hybrid electric vehicles. 68.3% of new vehicles registered in Norway in 2019 were either fully or half running on electricity. (OFV, 2020)

In order for a BEV to be truthfully and transparently, accounted as producing zero emissions after manufacturing, is to take a look at where the energy that charges the vehicle comes from. Is the vehicle being charged with fossil fuel energy or renewable energy, luckily there is some data available regarding the increase in popularity of renewable energy projects being presented in the next section of the thesis.

3.4 Renewable energy

Renewable energy refers to energy gathered from renewable natural resources such as wind, solar, hydroelectric, ocean, geothermal, biomass and biofuels which are all alternatives to fossil fuels like oil and gas, that contribute to GHG emissions. Renewable energy is an important subject to look into as, everything consumes energy, even if the automotive industry doesn't care about what sources the energy for your PHEV or EV comes from, it is an important aspect for the environment and even as the manufacturers of vehicles might not gain anything from consumers using renewable energy to charge their vehicles, they might have something to gain from the increase of renewable energy projects. As renewable energy gets more popular, it's more likely to be used in the production stage of all vehicles, not just EV's or PHEV's but ICE vehicles as well, using renewable energy in the production of vehicles is something the companies may also want to inform of in their yearly sustainability reports, which in turn, if communicated correctly might help in attracting some green consumers.

In order to truly evaluate the environmental friendliness of electric vehicles for instance, taking into consideration that they use electricity in the manufacturing process as well as a source of energy for the motors to keep the cars running. If the energy consumed in electric vehicles is from other than renewable sources, it almost defeats the entire purpose of these new environmentally friendly vehicles. Fortunately, we can see from

research produced by IRENA (International Renewable Energy Agency) that renewable energy is growing in popularity all over the globe as explained in the research results.

IRENA is an intergovernmental organization that supports countries in transitioning to a future of sustainable energy, they currently have more than 180 countries actively engaged in IRENA's promotion of renewable resources and technologies as the key to a sustainable future and helping countries achieve their renewable energy potential.

According to IRENA's (2020) research, green energy made up 72% of all new energy projects in 2019, out of which 90% was formed of solar and wind energy. The 72% of new energy projects is a net increase in global renewable energy generation capacity of 176GW or 7.4% from the previous year, (2018) bringing the global total renewable energy capacity to 2537GW (see figure 9).

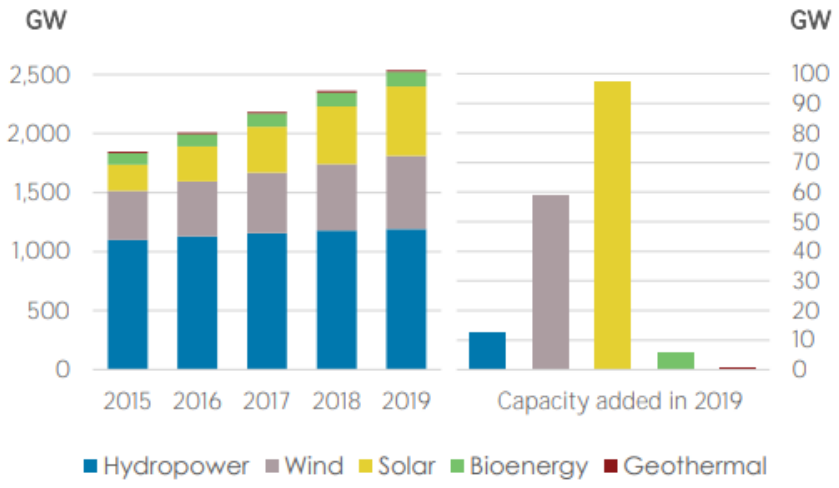

Figure 9. Global renewable energy production capacity (IRENA, 2020).

Geographically Asia was the area with the largest increase, with 54% of new renewable energy projects Asia increased their capacity by 95,5GW, reaching 1.12TW of 44% of the global total. Europe and North America increased their capacity by 35GW (6.6%) and 22GW (+6.0%), respectively, while Oceania and the middle east were the fastest growing regions with 18.4% and 12.6% growth respectively. Africa managed to increase its capacity by 4.3%. Regional renewable energy generation capacity has increased in all parts of the world. (see figure 10)

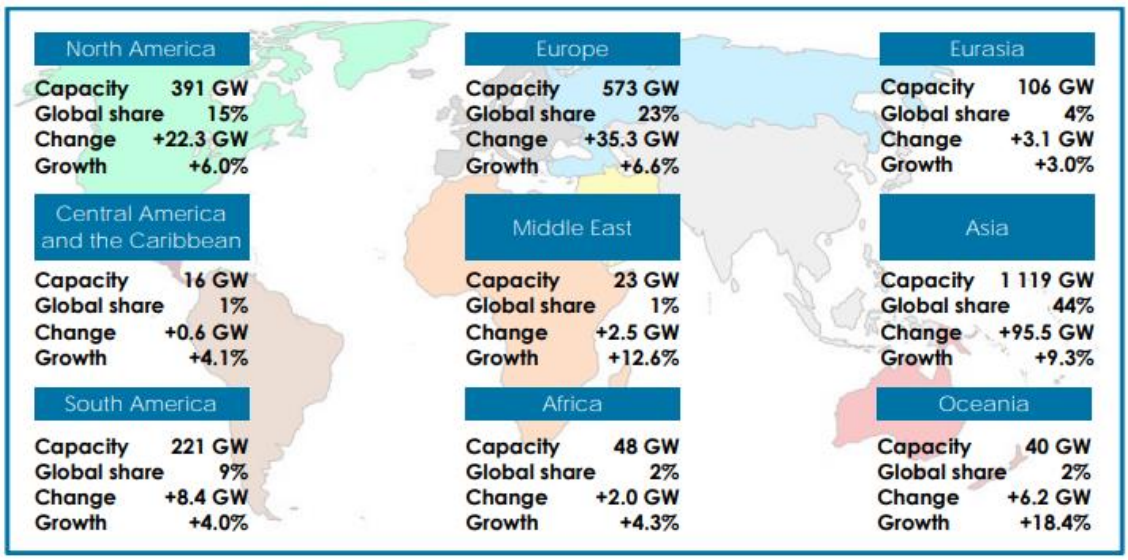

Figure 10. Regional renewable energy generation capacity (IRENA, 2020).

According to the research and data collected by IRENA, we can see that renewable energy is growing in popularity all over the globe, even if the growth is slightly lower in some continents than others, progress is being made.

Renewable energy is continuously an important part of mitigating GHG efforts in the EU and its member states. Energy production from renewable sources increased significantly across the EU as gross wind energy production grew by 7.4% within 22 member states of the EU, and the six largest relative increases were in Luxembourg with 27&, the United Kingdom with 23% and Finland with 22%. The largest absolute contributions from wind energy were in Germany, France and the United Kingdom. (EEA, 2019)

Having more renewable energy projects around the globe affects the environmental friendliness of a large portion of business and production as well as energy consumption, as for example, electric vehicle manufacturing will be done by using entirely renewable energy sources as well as charging the EV on the road with renewable energy rather than energy form non- renewable sources, decreases the CO2 consumption levels of the vehicle through out its entire life cycle.

4 Research methodology

Looking into academic research, there are three fundamental types of research, which are descriptive, explanatory and predictive.

Descriptive research simply aims to describe phenomena while not trying to understand why behaviour is what it is. Descriptive research is very useful in setting up baselines or templates on how we think the world is, often being the starting point of any research project into phenomena, also known as exploratory study, of which we know very little. Aiming to describe social systems or relationships between events and providing background information about the issue in question as well as stimulating explanations.

Explanatory research goes deeper than descriptive research in the sense that it will attempt to describe phenomena and explain why the behaviour is what it is. Or in other words, explanatory research allows us to understand the very nature of what we are actually looking at. Explaining social relations or events, advancing knowledge about structure, process and nature of events and linking different factors and elements into general statements and building testing and revising a theory is what this type of research aims to describe.

Predictive research, as the name suggests takes it one step further and not only does it attempt to explain behaviour but also predict the future behaviour having any changes in explanatory variables relevant to any particular phenomenon. If we can understand physical and human phenomena then we would be in a better position to predict the future path and might even be possibly change it. Predictive research is used in designing and applying policies and is thus very important to governments. Most research, especially academic, will usually include some aspects of all three research types, although predictive research is most often quite difficult and proves problematic. In practice most research will include aspects of all the research ‘types’, although the third one is often the most difficult and problematic. (Adams, Khan & Raeside, 2014)

Research methodology, explains how we know what we know, it helps us understand the concept of what knowledge is and how it can be created (Adams, Khan & Raeside, 2014) Research methodology allows the researcher to critically evaluate the reliability

and validity of the study by using techniques and procedure to select and process information on any given research topic. (Saunders, 2009)

In this paper, methods of qualitative research are used. Adams, Khan & Raeside (2014), define quantitative research as the type of research which is based on methodological principles of positivism and neo-positivism, and it adheres to the standards of a strict research design developed prior to the actual research. It will be statistically analysed as it is applied for quantitative measurement. According to Adams quantitative research is used in almost every sphere of life, such as in clinical, biological, epidemiological, sociological and business research.

Qualitative research uses a number of methodological approaches based on diverse theoretical principles (Phenomenology, hermeneutics and social interactionism). It employs methods of data collection and analysis that are non-quantitative, aims towards the exploration of social relations and describes reality as experienced by the respondents. Qualitative research methods have long been used in the field of social sciences. For instance, these are the principal methods employed by anthropologists to study the customs and behaviours of people from other cultures and are also used in such diverse areas as sociology, psychology, education, history and cultural studies. These methods have much to offer in studying the health and well-being of people and their daily lives in business and home. (Adams, Khan & Raeside, 2014)

This research is based on secondary sources. According to Adams, Khan & Raeside, (2014) the advantages of secondary data are,

- Large representative samples well beyond the resources of the individual researcher are available.
- Good for examining longitudinal data and looking for trends.
- Supporting documentation and explanation of methodology, sampling strategy, data codes are given.
- The researcher can concentrate on data analysis and interpretation.

They also list the disadvantages of secondary data which are the following,

- Data compatibility: does the information match what is required for your research?
- Data coverage: does the information cover all subjects or groups in your research?
- There can be depth limitation in that you may see a trend or an oddity in a time series but there may be no data available to allow investigation of the reasons or consequences.
- Does the information come from all time periods or are there gaps?
- Consistency of time series.
- Historical and therefore may not be relevant to current issues.
- Need to assess the quality of the data and the approach used in initial gathering of the data. You must consider the authenticity of the data and the source.

As we can see from the figure provided by Saunders (2009), secondary data can be categorised into three different main sections, which are documentary, multiple source and survey. These three main categories of secondary data have extra sections below them which are listed but not limited to the ones mentioned in the figure below. (see Figure 11)

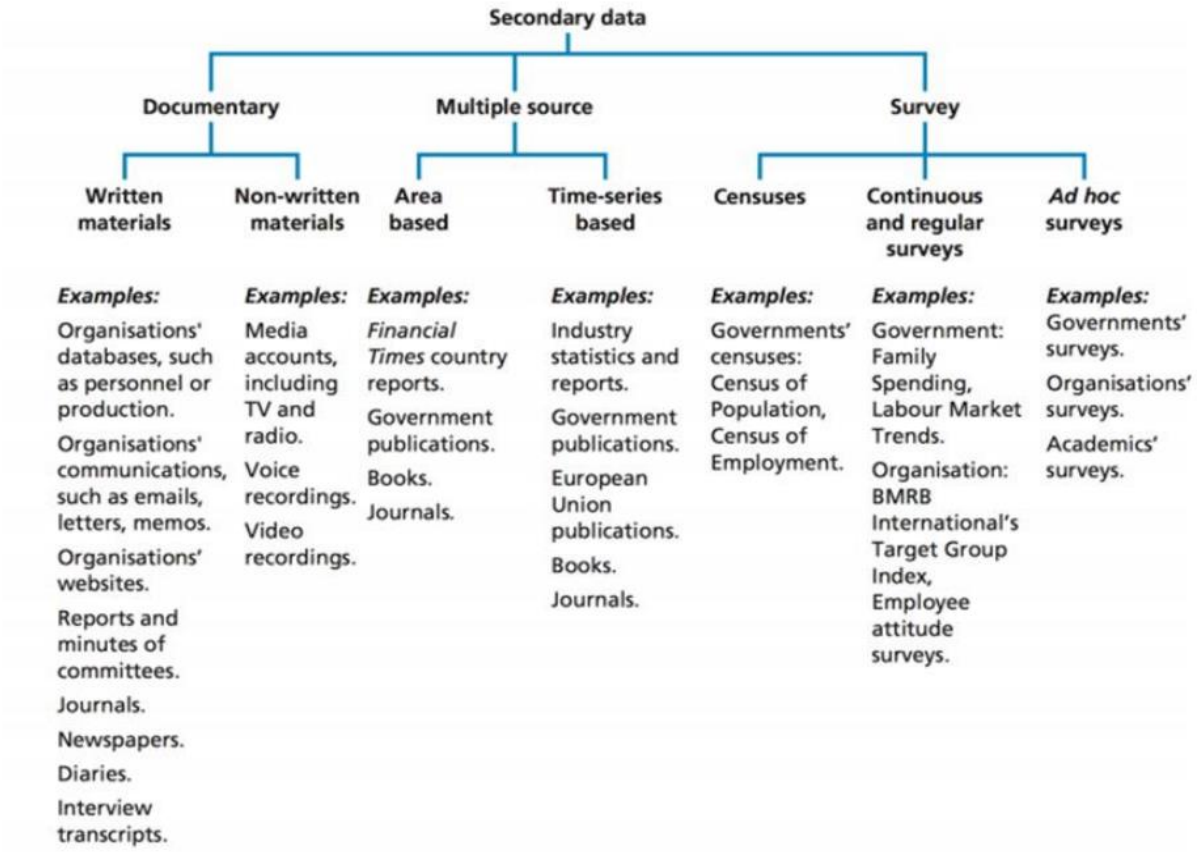

Figure 11. Different types of secondary data. (Saunders, 2009).

As sustainability on its own is a largely researched topic, the decision was made to perform a qualitative research through secondary data sources in order to gain a comprehensive and global understanding of the subject matter. The data collected for this thesis came from secondary data sources such as, books, e-books, websites, news channels, surveys, corporate reports, scientific studies and journal articles. After collecting enough secondary data for the thesis, it was analysed for all relevant material. Finally, after defining the relevant secondary data, the data was then carefully analysed to investigate whether environmental sustainability exists and how it can be seen in the automotive industry and marketing.

The secondary data gathered and analysed is presented so that the reader will gain a proper understanding in the matters of sustainability, environmental marketing,

environmentally friendly regulations affecting the automotive industry and how the automotive industry either is or is not progressive in their past and future actions.

4.1 Limitations

The decision to base this thesis on qualitative research based on secondary data was made as the original intention of having interviews included in the thesis was deemed fairly challenging. As we are currently at the time of writing this thesis facing the covid-19 pandemic, acquiring any interviews is currently a lot more troublesome and poses unnecessary risk. Due to this global situation and for example all libraries being closed I have been forced to use mainly sources found online. Fortunately I had gathered a good amount of data before everything closed and was able to use that as the foundation of my analysis, but it is possible that had I had the possibility to go to a library, the sources used could have been even more diverse.

5 Research results and conclusion

This thesis examined environmental sustainability in the automotive industry, and pursued answering the research question of how the automotive industry is adapting to going green. The intention has been to explain environmental sustainability, what and why it is important and trending at the moment. Green marketing, sometimes referred to as environmental marketing and greenwashing were important concepts as they play an important part in the automotive industry going green and to explain to the reader what the difference is between the two, sometimes mixed up terms, as well as how they can be seen in the automotive industry.

After the literature review, the motivations for the automotive industry to even go green were examined. Some of these were governmental regulations that force the hand of the automotive industry to produce more environmentally friendly vehicles by setting standards and limitations on CO2 emissions that are allowed from a vehicle. This paper examined how the automotive industry has had its part in total GHG's as well as what kind of sanctions and payments the automotive industry as a whole might have to pay in case they are not able to produce vehicles with lower emissions, one of the notions made

was that if nothing changes from the numbers of 2017, which of course is extremely unlikely, the automotive industry as a whole would face an estimated 34 billion euros in fines within the European Union.

Multiple different car manufacturers have been accused of greenwashing their products. However, it is primarily Volkswagen that is known for attempting to greenwash their products in order to attract green consumers as well as comply with regulations set by the EPA and other governmental agencies. Because of this, the company had to recall over 11 million vehicles and pay fines worth of millions of dollars. No one at Volkswagen expected the repercussions of getting caught using a cheat device to be so severe. Thanks to this dieselgate scandal, multiple governmental organisations have kept on tightening regulations as well as surveillance of car companies and making sure their products emitt the amount of GHG's as advertised. As a response to these regulations as well as the rise of green consumerism and the overall trend of sustainability, the automotive industry has increased the production and marketing of PHEV's as well as more importantly BEV's which are fully electric and produce no direct emissions after production.

However, although the BEV's are marketed as the green alternative, the problem is still that manufacturing them is more harmful to the environment than the manufacturing of ICE vehicles. This will likely change as the number of renewable energy projects are increasing all around the globe each year. In addition, renewable energy plays a major part in the environmental friendliness of BEV's especially since in order for a BEV to cause zero emissions as car manufacturers claim is that they are in fact charged with energy produced from renewable sources instead of energy produced by fossil fuels for example. As the number of renewable energy projects keep increasing it projects a more optimistic future for emissions related to the automotive industry among many others.

The automotive industry has adapted to manufacturing and marketing the greener alternatives well, if one does not take into account their first stumbles with greenwashing. Presumably, Volkswagen as well as other car manufacturers have learned from these scandals and even noticed that they need to innovate, design, manufacture and invest into research and development of sustainable vehicles and solutions in order to stay relevant. In recent years the advances made in BEV's for example are remarkable. Going

from WLTP ranges of only a 100 or so kilometres per charge to 500-600 kilometres or more WLTP range per charge, they have addressed the issue of range anxiety in consumers extremely well. Companies in the automotive industry have invested heavily in research and development, transparency and environmental sustainability, as well as reporting about it through communication that is much more transparent and in line with governmental regulations than they may have been in the past.

Governmental agencies as well a green consumers need to continuously apply pressure into the automotive industry in order to ensure that they are following regulations, and providing transparent information about their practices. The automotive industry will invest in R&D and innovate new green solutions and improve sustainable vehicles even further as long as official agencies keep following climate goals and enforcing sanctions on companies that break the law or intentionally mislead consumers. As long as these policies and sanctions are being enforced, they will manifest as green marketing and different forms of greenwashing within the automotive industry. The trend of sustainability does not seem to be losing any traction and as the amount of renewable energy projects keeps increasing, green marketing will most likely increase in popularity.

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Appendix 1. Jyrki Katainen Vice-President for Jobs, Growth, Investment and Competitiveness commenting on Volkswagen's emission scandal

"In a Single Market where goods circulate freely, everyone must play by the rules. The Volkswagen revelations have highlighted that the system which allows cars to be placed on the market needs further improvement. To regain customers' trust in this important industry, we need to tighten the rules but also ensure they are effectively observed. It is essential to restore a level playing field and fair competition in the market."

Source: (European Commission, 2016).